PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	FREITAG et al.	Examiner:	CAO, A.
Serial No.:	10/712,168	Group Art Unit:	2652
Filed:	November 12, 2003	Docket No.:	HSJ920030108US1 (HITG.044PA-552)
Title:	METHOD AND APPARATUS FOR PROVIDING MAGNETOSTRICTION CONTROL IN A FREELAYER OF A MAGNETIC MEMORY DEVICE		

APPEAL BRIEF

Mail Stop Appeal
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

This is an Appeal Brief submitted pursuant to 37 C.F.R. § 41.37 for the above-referenced patent application. Please charge Deposit Account No. 50-2587 (**HSJ920030108US1**) in the amount of $500.00 for this brief in support of appeal as indicated in 37 C.F.R. § 41.20(b)(2).

I. Real Party in Interest

The real party in interest is HITACHI GLOBAL STORAGE TECHNOLOGIES NETHERLANDS B.V., having a place of business at Locatellikade 1, Parnassustoren, 1076 AZ Amsterdam, The Netherlands (hereinafter called HITACHI).

II. Related Appeals and Interferences

Appellants are unaware of any related appeals, interferences or judicial proceedings.

III. Status of Claims

Claims 1-17 were rejected. Claims 1-17 are presented for appeal and may be found in the attached Appendix of Appealed Claims in their present form.

IV. Status of Amendments

An initial Office Action was mailed on September 1, 2005. A response to the initial Office Action was mailed on December 27, 2005. A final Office Action was mailed on March 23, 2006. A response to the final Office Action was filed on May 19, 2006 under 37 C.F.R. § 1.116. By way of Advisory Action mailed June 7, 2006, the remarks presented in the response of September 13, 2005 were noted as being entered into the record, but were deemed to not place the application in condition for allowance.

V. Summary of Invention

A method and apparatus for providing magnetostriction control in a free layer of a magnetic memory device is disclosed.

In independent claim 1, a method for controlling magnetostriction in a free layer of a magnetic memory device includes forming a pinned layer (610, page 15, line 5; 1210, page 17, lines 15-16), forming a separation layer over the pinned layer (620, page 15, line 5; 1220, page 17, line 16), forming a first free layer having a first thickness (632, page 15, lines 6-7) and forming a second free layer having a second thickness (634, page 15, lines 6-7), the ratio of the first thickness (640, page 15, lines 11-19) and second thickness (642, page 15, lines 11-19) being selected to provide a desired magnetostriction (710, page 16, lines 11-15; 1230, page 17, lines 16-19).

In independent claim 5, a magnetic sensor includes a pinned layer (610, page 15, line 5), a separation layer formed over the pinned layer (620, page 15, line 5), a first free layer

having a first thickness formed over the separation layer (632, page 15, lines 6-7) and a second free layer having a second thickness formed over the first free layer (634, page 15, lines 6-7), wherein the ratio (710, page 16, lines 11-15) of the first thickness (640, page 15, lines 17) and second thickness (642, page 15, lines 18) is selected to provide a desired magnetostriction (642, page 15, lines 11-19).

In independent claim 9, a magnetic tunnel junction sensor (500, page 13, lines 14-15) includes a magnetic tunnel junction device . The magnetic tunnel junction device includes a pinned layer (610, page 15, line 5), an insulation layer formed over the pinned layer (620, page 15, line 5), a first free layer (632, page 15, lines 6-7) having a first thickness (640, page 15, lines 17) formed over the insulation layer and a second free layer (634, page 15, lines 6-7) having a second thickness (642, page 15, lines 18) formed over the first free layer, wherein the ratio (710, page 16, lines 11-15) of the first thickness (640, page 15, lines 17) and second thickness (642, page 15, lines 18) is selected to provide a desired magnetostriction (642, page 15, lines 11-19). The magnetic tunnel junction sensor (500, page 13, lines 14-15) also includes a current source (534, page 14, lines 10-12) coupled to the magnetic tunnel junction device and a magnetoresistance detector (540, page 14, lines 12-15), coupled to the magnetic tunnel junction device, for detecting an electrical resistance through the magnetic tunnel junction device based on magnetic orientations of the first (632, page 15, lines 6-7) and the second (634, page 15, lines 6-7) free layers.

In independent claim 11, a magnetic storage system (100, page 11, lines 12) includes a movable magnetic recording medium (130, page 11, lines 14-15), a magnetic sensor (500, page 13, lines 14-15) for detecting magnetic signals on the moveable recording medium, a magnetoresistance detector (540, page 14, lines 12-15), coupled to the magnetic sensor, for

detecting an electrical resistance through the magnetic sensor based on magnetic orientations of the first (632, page 15, lines 6-7) and the second (634, page 15, lines 6-7) free layers and an actuator, coupled to the magnetic sensor, for moving the sensor relative to the medium. The magnetic sensor includes a pinned layer (610, page 15, line 5), an insulation layer formed over the pinned layer (620, page 15, line 5), a first free layer (632, page 15, lines 6-7) having a first thickness (640, page 15, lines 17) formed over the insulation layer and a second free layer (634, page 15, lines 6-7) having a second thickness (642, page 15, lines 18) formed over the first free layer, wherein the ratio (710, page 16, lines 11-15) of the first thickness (640, page 15, lines 17) and second thickness (642, page 15, lines 18) is selected to provide a desired magnetostriction (642, page 15, lines 11-19).

In independent claim 13, a spin valve sensor (500, page 13, lines 14-15) includes a bilayer free layer structure (630, page 15, lines 12-13), the bilayer free layer structure including a first free layer (632, page 15, lines 6-7) having a first thickness (640, page 15, lines 17) formed and a second free layer (634, page 15, lines 6-7) having a second thickness (642, page 15, lines 18) formed over the first free layer, wherein the ratio (710, page 16, lines 11-15) of the first thickness (640, page 15, lines 17) and second thickness (642, page 15, lines 18) is selected to provide a desired magnetostriction (642, page 15, lines 11-19). A ferromagnetic pinned layer structure having a magnetic moment (610, page 15, line 5) is provided. A nonmagnetic conductive separation layer is disposed between the free layer structure and the pinned layer structure (620, page 15, line 5). An anti-ferromagnetic pinning layer (524, page 14, lines 1-2) is coupled to the pinned layer structure for pinning the magnetic moment of the pinned layer structure. A hard magnetic thin film (526, 528, page 14, lines 6-7) is disposed in an abutting relationship with the free layer structure on both

sides of the free layer structure. A seedlayer structure (550, page 14, lines 7-9) is formed adjacent the pinning layer structure.

In independent claim 15, a spin valve sensor (500, page 13, lines 14-15) is provided. The spin valve sensor 500, page 13, lines 14-15) includes a bilayer free layer structure (630, page 15, lines 12-13), the bilayer free layer structure includes a first free layer (632, page 15, lines 6-7) having a first thickness (640, page 15, lines 17) and a second free layer (634, page 15, lines 6-7) having a second thickness (642, page 15, lines 18) formed over the first free layer, wherein the ratio (710, page 16, lines 11-15) of the first thickness (640, page 15, lines 17) and second thickness (642, page 15, lines 18) is selected to provide a desired magnetostriction (642, page 15, lines 11-19). A self-pinned layer structure having a magnetic moment (610, page 15, line 5) is provided. A nonmagnetic conductive separation layer is disposed between the free layer structure and the pinned layer structure (620, page 15, line 5). A hard magnetic thin film (526, 528, page 14, lines 6-7) is disposed in an abutting relationship with the free layer structure on both sides of the free layer structure. A seedlayer structure (550, page 14, lines 7-9) is formed adjacent the pinning layer structure.

In independent claim 17, a magnetic sensor (500, page 13, lines 14-15) is provided. The magnetic sensor (500, page 13, lines 14-15) includes means for providing a fixed magnetic orientation (610, page 15, line 5), bilayer means (630, page 15, lines 12-13), disposed over the means for providing a fixed magnetic orientation, for sensing a magnetic field, the bilayer means (630, page 15, lines 12-13) including first (632, page 15, lines 6-7) and second (634, page 15, lines 6-7) means for providing a magnetization that is free to rotate, the first means (632, page 15, lines 6-7) having a first thickness (640, page 15, lines 17) for sensing a magnetic field and second means (634, page 15, lines 6-7) having a second

thickness (642, page 15, lines 18) for sensing a magnetic field. The magnetic sensor (500, page 13, lines 14-15) also includes means for separating (620, page 15, line 5) the means for providing a pinning field from the bilayer means. The ratio (710, page 16, lines 11-15) of the first thickness (640, page 15, lines 17) and second thickness (642, page 15, lines 18) is selected to provide a desired magnetostriction (642, page 15, lines 11-19).

VI. Grounds of Rejection

Appellant has attempted to comply with new rule 37 C.F.R. § 41.37(c) by providing the Office Action's grounds of rejection verbatim, followed by an argument section corresponding thereto.

A. In paragraph 2 on page 2 of the Office Action, claims 1-8 and 13-17 were rejected under 35 U.S.C. § 102(e) as being anticipated by Pinarbasi.

B. B.In paragraph 4 on page 3 of the Office Action, claims 9-12 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Pinarbasi in view of Gill.

C. C.In paragraph 6 on page 5 of the Office Action, claims 1-8 and 13-17 were rejected under 35 U.S.C. § 102(e) as being anticipated by Ohsawa et al.

D. D.In paragraph 8 on page 5 of the Office Action, claims 9-12 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Ohsawa et al.

E. E.In paragraph 9 on page 7 of the Office Action, claims 13-16 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Ohsawa et al.

VII. Argument

A. CLAIMS 1, 5, 9, 11, 13, 15 and 17 ARE PATENTABLE OVER PINARBASI, GILL AND OHSAWA ET AL.

1. Pinarbasi, Gill and Ohsawa et al., alone or in combination Fail To Disclose, Teach Or Suggest the Limitations of Claims 1, 5, 9, 11, 13, 15 and 17.

The Office Action states that Pinarbasi describes a sensor having a first and second free layer. The Office Action states that the first and second free layers inherently have a thickness. The Office Action also states that the free layers have a magnetostriction. Thus, according to the Office Action, the ratio of the thickness of the first free layer thickness to the second free layer thickness is inherently selected to provide a desired magnetostriction.

Until discovered by Appellant's, magnetostriction control for a bilayer free layer structure was accomplished by changing the composition of one of the layers, e.g., the NiFe or CoFe layer. However, changing the composition of a layer is very time consuming and

costly. Moreover, changing the composition of a layer has been used to provide a desired sensor designs change.

Pinarbasi does not teach the limitation of selecting a thickness for the first or the second free layer. In fact, Pinarbasi fails to suggest that the magnetostriction is a factor that needs to be selected. Pinarbasi does not even mention the term or concept of "ratio." Furthermore, Pinarbasi never mentions any desire for a free layer structure to have a particular magnetostriction.

Moreover, even if Pinarbasi is held to inherently teach that a thickness for the first and the second free layer is selected, Pinarbasi fails to suggest that the "ratio" of the thickness for the first free layer to the thickness of the second free layer is "selected" to provide a "desired magnetostriction." Pinarbasi fails to suggest that the magnetostriction can even be selected by selecting a ratio for the thickness of the first and second free layer. Pinarbasi is simply not concerned with the setting of the magnetostriction of the free layer structure.

Because Pinarbasi does not teach, disclose or suggest selecting a ratio for the thickness of a first free layer and a thickness of a second free layer to provide a desired magnetostriction, claims 1, 5, 9, 11, 13, 15 and 17 are patentable over Pinarbasi.

Gill fails to overcome the deficiencies of Pinarbasi. Gill is merely cited for teaching a magnetoresistance detector. As with Pinarbasi, Gill does not teach, disclose or suggest selecting a ratio for the thickness of a first free layer to a thickness of a second free layer to provide a desired magnetostriction.

Gill does mention magnetostriction. However, Gill is concerned with the magnetostriction of the pinned layers rather than the free layers. According to Gill, one of the AP pinned layers has a higher positive magnetostriction than the other AP pinned layer.

During fabrication of the head assemblies the heads are lapped to a head surface, which causes compressive stress within the AP, pinned layers. Because of a positive magnetostriction in the one AP pinned layer it will have a magnetostrictive uniaxial anisotropy that is oriented perpendicular to the head surface. The higher magnetostrictive anisotropy in one of the AP pinned layers self-pins the AP pinned layer structure without the necessity of a pinning layer.

Therefore, Gill and Pinarbasi, alone or in combination, fail to teach, disclose or suggest selecting a ratio for the thickness of a first free layer and a thickness of a second free layer to provide a desired magnetostriction.

Ohsawa et al. fail to overcome the deficiencies of Pinarbasi and Gill. As with Pinarbasi and Gill, Ohsawa et al. fail to even mention magnetostriction. Moreover, Ohsawa et al. fail to disclose, teach or even suggest that a ratio for the thickness of a first and second free layer affects the magnetostriction. Ohsawa et al. simply fail to recognize the benefit of selecting a ratio for the thickness of a first free layer and a thickness of a second free layer.

Therefore, Gill, Pinarbasi and Ohsawa et al., alone or in combination, fail to teach, disclose or suggest selecting a ratio for the thickness of a first free layer and a thickness of a second free layer to provide a desired magnetostriction.

The final Office Action also stated that Applicants do not disclose the ratio and what the desired magnetostriction is. However, Fig. 7 illustrates a plot 700 of a ratio between CoFe/NiFe free layers according to an embodiment of the present invention. Fig. 7 shows that better control over magnetostriction can be achieved by changing CoFe/NiFe ratio in the free layer. In Fig. 7, the CoFe/NiFe deposition time ratio 710 varies from about 0.75 712 to

1.35 714, whereas the composite magnetostriction 730 only varies from -1.8×10^{-6} 732 to -0.4×10^{-6} 734.

Fig. 8 is a plot of the dR/R for a range of CoFe/NiFe ratios for a sensor according to an embodiment of the present invention. Fig. 9 is a plot of the sensor resistance for a range of CoFe/NiFe ratios according to an embodiment of the present invention. Fig. 10 is a plot of the coercivity of the free layer for a range of CoFe/NiFe ratios according to an embodiment of the present invention. Fig. 11 is a plot of the hard axis coercivity of the free layer for a range of CoFe/NiFe ratios according to an embodiment of the present invention; and

In view of the details provided in the specification with reference to Figs. 07-11, Appellant's respectfully submit that one skilled in the art would be able to select the ratio of the first thickness and second thickness to provide a desired magnetostriction without undue experimentation. In fact, a different magnetostriction is commonly needed for different applications. Thus, the specification and drawings found in Appellant's application provides a clear explanation of how the magnetostriction is affected by the ratio of the thickness of the first and second free layer and those skilled in the art can easily tailor their bilayer free layers to meet their designed requirements.

Again, Applicants recognized that the ratio could be adjusted to select a desired magnetostriction. Thus, Applicants are entitled to the broad concept of selecting a ratio for the thickness of a first free layer to a thickness of a second free layer to provide a desired magnetostriction.

Accordingly, Applicants respectfully submit that independent claims 1, 5, 9, 11, 13, 15 and 17 are patentable over Ohsawa et al., Gill and Pinarbasi.

B. CLAIMS 2, 6, 10, 12, 14 AND 16 ARE PATENTABLE OVER PINARBASI, GILL AND OHSAWA ET AL.

1. Pinarbasi, Gill and Ohsawa et al., alone or in combination Fail To Disclose, Teach Or Suggest Selecting The Ratio Of The First Thickness Of A First Free Layer And A Second Thickness Of A Second Free Layer To Provide A Desired Magnetostriction Wherein The First Free Layer Comprises CoFe And The Second Free Layer Comprises NiFe As Recited In Claims 2, 6, 10, 12, 14 and 16.

As discussed above, Pinarbasi fails to disclose, suggest or even appreciate the advantages of selecting a ratio of the thickness of a first free layer and the thickness of a second free layer. As such, Pinarbasi can hardly suggest the selection of a ratio of the thickness of a first free layer of CoFe and the thickness of a second free layer of NiFe.

Therefore, Pinarbasi fails to teach, disclose or suggest selecting a ratio for the thickness of a first free layer of CoFe and a thickness of a second free layer of NiFe to provide a desired magnetostriction.

Gill fails to overcome the deficiencies of Pinarbasi. As discussed in detail above, Gill also fails to disclose, suggest or even appreciate the advantages of selecting a ratio of the thickness of a first free layer and the thickness of a second free layer. Gill teaches a free layer of Fe and a free layer of NiFe. However, because Gill does not suggest selecting a ratio of the thickness of a first free layer and the thickness of a second free layer, Gill cannot be said to suggest the selection of a ratio of the thickness of a first free layer of CoFe and the thickness of a second free layer of NiFe.

Therefore, Gill and Pinarbasi, alone or in combination, fail to teach, disclose or suggest selecting a ratio for the thickness of a first free layer of CoFe and a thickness of a second free layer of NiFe to provide a desired magnetostriction.

Ohsawa et al. fails to overcome the deficiencies of Pinarbasi and Gill. As described above, Ohsawa et al. fail to even mention magnetostriction. Moreover, Ohsawa et al. fail to disclose, teach or even suggest that a ratio for the thickness of a first and second free layer affects the magnetostriction. Ohsawa et al. simply fail to recognize the benefit of selecting a ratio for the thickness of a first free layer and a thickness of a second free layer. Accordingly, Ohsawa et al. can not disclose selecting a ratio for the thickness of a first free layer of CoFe and a thickness of a second free layer of NiFe to provide a desired magnetostriction.

Therefore, Gill, Pinarbasi and Ohsawa et al., alone or in combination, fail to teach, disclose or suggest selecting a ratio for the thickness of a first free layer of CoFe and a thickness of a second free layer of NiFe to provide a desired magnetostriction.

Accordingly, claims 2, 6, 10, 12, 14 and 16 are patentable over Gill, Pinarbasi and Ohsawa et al., alone or in combination.

C. CLAIMS 3, 4, 7 AND 8 ARE PATENTABLE OVER PINARBASI, GILL AND OHSAWA ET AL.

1. Pinarbasi, Gill and Ohsawa et al., alone or in combination Fail To Disclose, Teach Or Suggest An Insulator or Conductor Being Disposed Between A Pinned Layer And A Bilayer Comprising A First And Second Free Layer Wherein The Ratio Of The First Thickness Of A First Free Layer And A Second Thickness Of A Second Free Layer Is Selected To Provide A Desired Magnetostriction As Recited In Claims 3, 4, 7 and 8.

As discussed above, Pinarbasi fails to disclose, suggest or even appreciate the advantages of selecting a ratio of the thickness of a first free layer and the thickness of a second free layer. As such, Pinarbasi does not suggest the selection of a ratio of the thickness of a first free layer and the thickness of a second free layer and wherein the first

and second free layer are separated from a pinned layer by an insulating layer or a conductor layer.

Therefore, Pinarbasi fails to teach, disclose or suggest selecting a ratio for the thickness of a first free layer and a thickness of a second free layer to provide a desired magnetostriction and wherein the first and second free layer are separated from a pinned layer by an insulating layer or a conductor layer.

Gill fails to overcome the deficiencies of Pinarbasi. As discussed in detail above, Gill also fails to disclose, suggest or even appreciate the advantages of selecting a ratio of the thickness of a first free layer and the thickness of a second free layer. Gill teaches a free layer of Fe and a free layer of NiFe. However, because Gill does not suggest selecting a ratio of the thickness of a first free layer and the thickness of a second free layer, Gill cannot be said to suggest the selection of a ratio of the thickness of a first free layer and the thickness of a second free layer and wherein the first and second free layer are separated from a pinned layer by an insulating layer or a conductor layer.

Therefore, Gill and Pinarbasi, alone or in combination, fail to teach, disclose or suggest selecting a ratio for the thickness of a first free layer and a thickness of a second free layer to provide a desired magnetostriction and wherein the first and second free layer are separated from a pinned layer by an insulating layer or a conductor layer.

Ohsawa et al. fails to overcome the deficiencies of Pinarbasi and Gill. As described above, Ohsawa et al. fail to even mention magnetostriction. Moreover, Ohsawa et al. fail to disclose, teach or even suggest that a ratio for the thickness of a first and second free layer affects the magnetostriction. Ohsawa et al. simply fail to recognize the benefit of selecting a ratio for the thickness of a first free layer and a thickness of a second free layer.

Accordingly, Ohsawa et al. can not disclose selecting a ratio for the thickness of a first free layer and a thickness of a second free layer to provide a desired magnetostriction and wherein the first and second free layer are separated from a pinned layer by an insulating layer or a conductor layer.

Therefore, Gill, Pinarbasi and Ohsawa et al., alone or in combination, fail to teach, disclose or suggest selecting a ratio for the thickness of a first free layer of CoFe and a thickness of a second free layer of NiFe to provide a desired magnetostriction.

Accordingly, claims 3, 4, 7 and 8 are patentable over Gill, Pinarbasi and Ohsawa et al., alone or in combination.

VIII. Conclusion

In view of the above, Appellants submit that the rejections are improper, the claimed invention is patentable, and that the rejections of claims 1-17 should be reversed. Appellants respectfully request reversal of the rejections as applied to the appealed claims and allowance of the entire application.

Respectfully submitted,

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APPENDIX OF APPEALED CLAIMS FOR APPLICATION NO. 10/712,168

1. (Original) A method for controlling magnetostriction in a free layer of a magnetic memory device, comprising:

forming a pinned layer;

forming a separation layer over the pinned layer;

forming a first free layer having a first thickness; and

forming a second free layer having a second thickness, the ratio of the first thickness and second thickness being selected to provide a desired magnetostriction.

2. (Original) The method of claim 1, wherein the first free layer comprises CoFe and the second free layer comprises NiFe.

3. (Original) The method of claim 1, wherein the separation layer is a conductor layer.

4. (Original) The method of claim 1, wherein the separation layer is an insulation layer.

5. (Original) A magnetic sensor, comprising:

a pinned layer;

a separation layer formed over the pinned layer;

a first free layer having a first thickness formed over the separation layer; and

a second free layer having a second thickness formed over the first free layer, wherein the ratio of the first thickness and second thickness is selected to provide a desired magnetostriction.

6. (Original) The magnetic sensor of claim 5, wherein the first free layer comprises CoFe and the second free layer comprises NiFe.

7. (Original) The magnetic sensor of claim 5, wherein the separation layer is a conductor layer.

8. (Original) The magnetic sensor of claim 5, wherein the separation layer is an insulation layer.

9. (Original) A magnetic tunnel junction sensor, comprising:

a magnetic tunnel junction device comprising:

a pinned layer;

an insulation layer formed over the pinned layer;

a first free layer having a first thickness formed over the insulation layer; and

a second free layer having a second thickness formed over the first free layer, wherein the ratio of the first thickness and second thickness is selected to provide a desired magnetostriction;

a current source coupled to the magnetic tunnel junction device; and

a magnetoresistance detector, coupled to the magnetic tunnel junction device, for detecting an electrical resistance through the magnetic tunnel junction device based on magnetic orientations of the first and the second free layers.

10. (Original) The magnetic tunnel junction sensor of claim 9, wherein the first free layer comprises CoFe and the second free layer comprises NiFe.

11. (Original) A magnetic storage system, comprising:

a movable magnetic recording medium;

a magnetic sensor for detecting magnetic signals on the moveable recording medium, comprising:

a pinned layer;

a separation layer formed over the pinned layer;

a first free layer having a first thickness formed over the separation layer; and

a second free layer having a second thickness formed over the first free layer, wherein the ratio of the first thickness and second thickness is selected to provide a desired magnetostriction;

a magnetoresistance detector, coupled to the magnetic sensor, for detecting an electrical resistance through the magnetic sensor based on magnetic orientations of the first and the second free layers; and

an actuator, coupled to the magnetic sensor, for moving the sensor relative to the medium.

12. (Original) The magnetic storage system of claim 11, wherein the first free layer comprises CoFe and the second free layer comprises NiFe.

13. (Original) A spin valve sensor, comprising

a bilayer free layer structure, the bilayer free layer structure including a first free layer having a first thickness formed and a second free layer having a second thickness formed over the first free layer, wherein the ratio of the first thickness and second thickness is selected to provide a desired magnetostriction;

a ferromagnetic pinned layer structure having a magnetic moment;

a nonmagnetic conductive separation layer disposed between the free layer structure and the pinned layer structure;

an anti-ferromagnetic pinning layer coupled to the pinned layer structure for pinning the magnetic moment of the pinned layer structure;

hard magnetic thin films in an abutting relationship with the free layer structure on both sides of the free layer structure; and

a seedlayer structure adjacent the pinning layer structure.

14. (Original) The spin valve sensor of claim 13, wherein the first free layer comprises CoFe and the second free layer comprises NiFe.

15. (Original) A spin valve sensor, comprising

a bilayer free layer structure, the bilayer free layer structure including a first free layer having a first thickness and a second free layer having a second thickness formed over the first free layer, wherein the ratio of the first thickness and second thickness is selected to provide a desired magnetostriction;

a self-pinned layer structure having a magnetic moment;

a nonmagnetic conductive separation layer disposed between the free layer structure and the self-pinned layer structure;

hard magnetic thin films in an abutting relationship with the free layer structure on both sides of the free layer structure; and

a seedlayer structure adjacent the pinning layer structure.

16. (Original) The spin valve sensor of claim 15, wherein the first free layer comprises CoFe and the second free layer comprises NiFe.

17. (Original) A magnetic sensor, comprising:

means for providing a fixed magnetic orientation;

bilayer means, disposed over the means for providing a fixed magnetic orientation, for sensing a magnetic field, the bilayer means including first and second means for providing a magnetization that is free to rotate, the first means having a first thickness for sensing a magnetic field and second means having a second thickness for sensing a magnetic field;

means for separating the means for providing a pinning field from the bilayer means;

wherein the ratio of the first thickness and second thickness is selected to provide a desired magnetostriction.

APPENDIX OF EVIDENCE FOR APPLICATION NO. 10/712,168

Appellants are unaware of any evidence submitted in this application pursuant to 37 C.F.R. §§ 1.130, 1.131, and 1.132.

APPENDIX OF RELATED PROCEEDINGS FOR APPLICATION NO. 10/712,168

As stated in Section II above, Appellants are unaware of any related appeals, interferences or judicial proceedings.